Faculty of Science
Chemistry Department

Synthesis of Some Terpolymer Nanocomposites and Their Evaluation as Additives for Some Petroleum Products

A Thesis Submitted for the Requirement of Ph.D. Degree

In (Chemistry)

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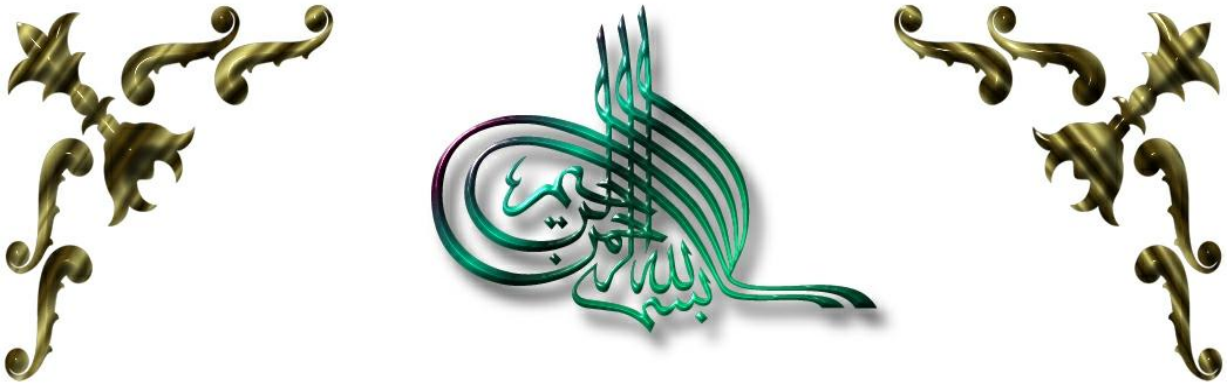

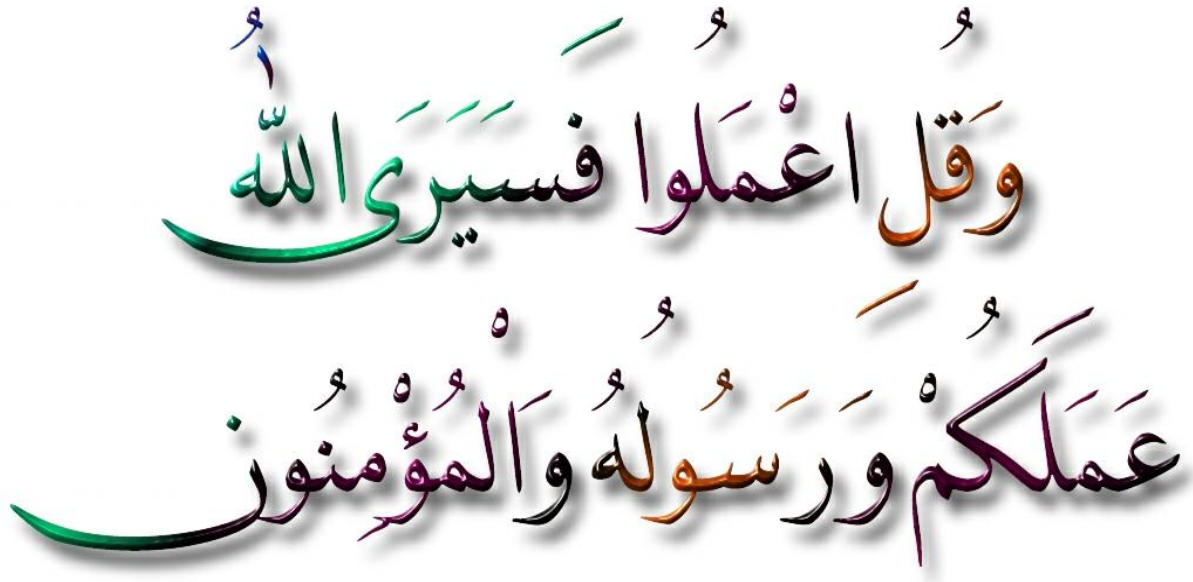

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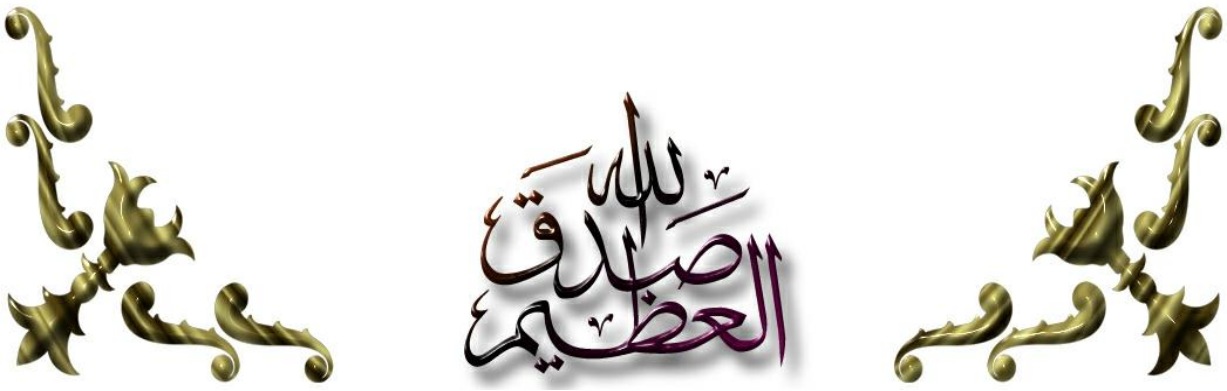

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Aim of the Work

Name: Abeer Abd El Galeel Abd El Mageed Hassan El-Segaey

Title of thesis: Synthesis of Some Terpolymer Nanocomposites and Their Evaluation as Additives for Some Petroleum Products.

<u>This study aims to:</u>

- Preparation of novel terpolymers and terpolymer nanocomposites by reaction between prepared esters/amide with α-olefins and nanoclay (montmorillonite).
- Identification of the chemical structures of the prepared polymers by using several analyses; FT-IR, ^{1}HNMR, DLS, HR-TEM, EDX, TGA, POM and GPC.
- Evaluation of the prepared polymeric additives as pour point depressants and viscosity indices improvers for petroleum products.
- Determination of rheological properties of petroleum products at different temperatures 25, 45 and 65 ^{o}C.
- Determination of tribological properties of lube oil.

LIST of ABBREVIATIONS

Symbols	Description
^{1}H-NMR	Proton nuclear magnetic resonance
cP	Centipoise
D	Shear-rate
DEME	Diethyl maleate ester
DEME-HDMA-HD (TP_3)	Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate Amide) (1-hexadecane)
DEME-HDMA-HD-NMMT (PNC_3)	Nanohybrid of Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate amide) (1- hexadecane)
DEME-HDMA-OD (TP_4)	Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate Amide) (1-octadecane)
DEME-HDMA-OD-NMMT (PNC_4)	Nanohybrid of Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate amide) (1- octadecane)
DEME-HDME-HD (TP_1)	Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate Ester) (1-hexadecane)
DEME-HDME-HD-NMMT (PNC_1)	Nanohybrid of Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate Ester) (1- hexadecane)
DEME-HDME-OD (TP_2)	Poly(Diethyl Maleate) –ter- (Hexadecyl Methacrylate Ester) (1-octadecane)
DEME-HDME-OD-	Nanohybrid of Poly(Diethyl

NMMT (PNC_2)	Maleate) –ter- (Hexadecyl Methacrylate Ester) (1- octadecane)
DLS	Dynamic Light Scattering
EVA	Eythylenvinylacetate
EVA	Ethylen-vinyl acetate
FTIR	The Fourier transform infrared
GPC	Gel Permeation Chromatography
HD	1- hexadecene
HDMA	Hexadecyl Methacrylate Amide
HDME	Hexadecyl Methacrylate Ester
HRTEM	High-resolution transmission electron microscopy
MMT	Montmorillonite
NMMT	Nanoclay Montmorillonite
NPPD	Nano-hybrid pour point depressant
NPs	Nanoparticles
OD	1-octadecene
OMS	Octadecyl methacrylate, maleic anhydride and styrene terpolymer
POM	Polarizing optical microscopy
PP	Pour point
PPD	Pour point depressant
ppm	Part per million
PTSA	p-Toluenesulfonic acid
τ	Shear-stress
τ_B	Yield stress
TGA	Thermogravimetric analysis
THF	Tetrahydrofuran

VI	Viscosity index
VII	Viscosity index improver
WAT	Wax Appearance Temperature
η	Apparent viscosity

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(3.7)	at 10000 ppm	

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